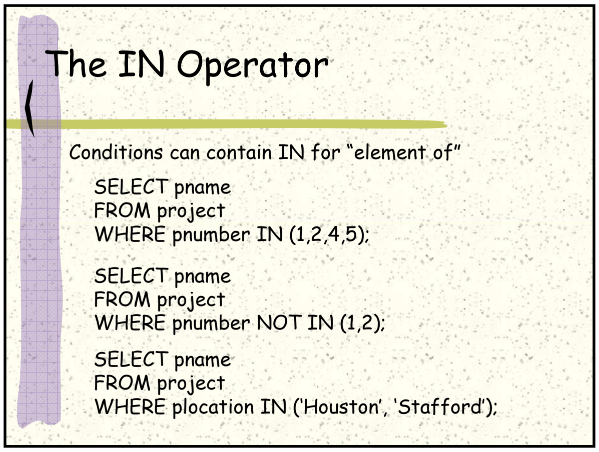
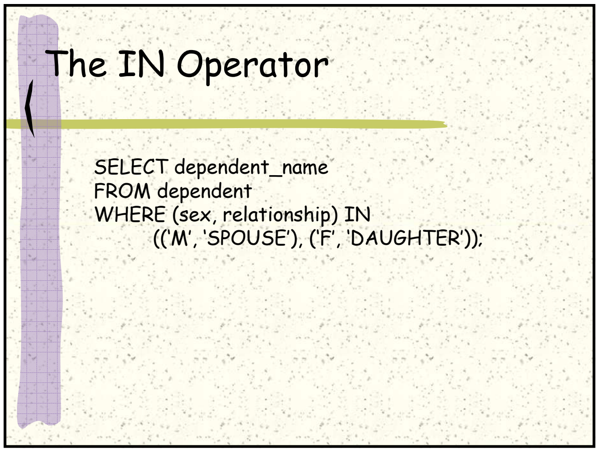


The IN Operator

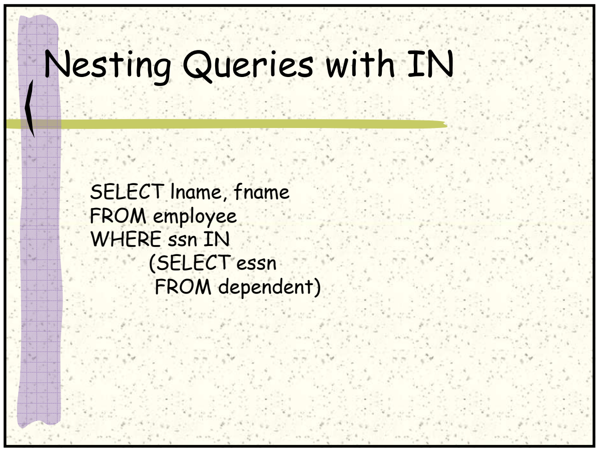
Conditions can contain IN for “element of”

```
SELECT pname
FROM project
WHERE pnumber IN (1,2,4,5);

SELECT pname
FROM project
WHERE pnumber NOT IN (1,2);

SELECT pname
FROM project
WHERE plocation IN (‘Houston’, ‘Stafford’);
```



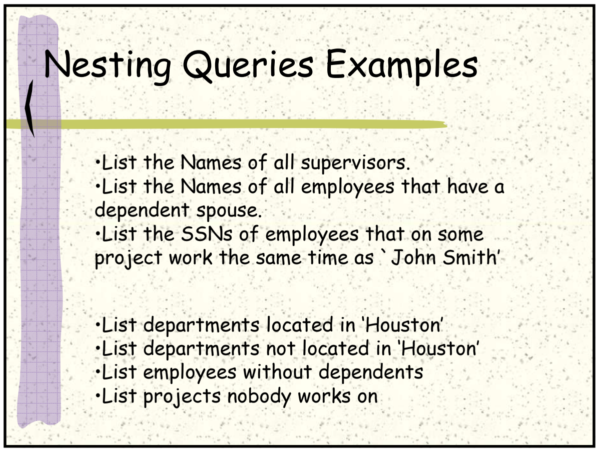
The IN Operator

```
SELECT dependent_name
FROM dependent
WHERE (sex, relationship) IN
        ((‘M’, ‘SPOUSE’), (‘F’, ‘DAUGHTER’));
```



Nesting Queries with IN

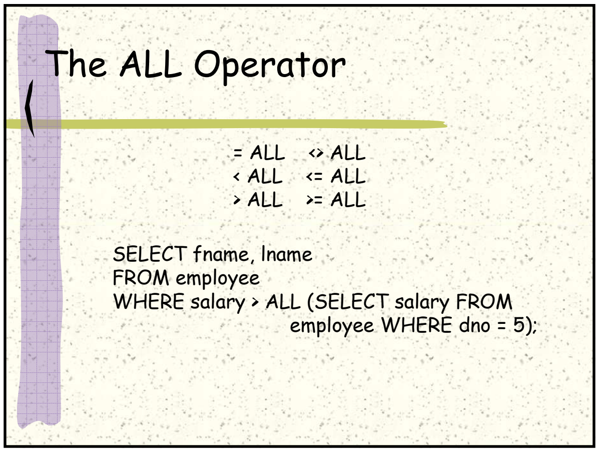
```
SELECT lname, fname
FROM employee
WHERE ssn IN
        (SELECT essn
         FROM dependent)
```



Nesting Queries Examples

- List the Names of all supervisors.
- List the Names of all employees that have a dependent spouse.
- List the SSNs of employees that on some project work the same time as `John Smith'

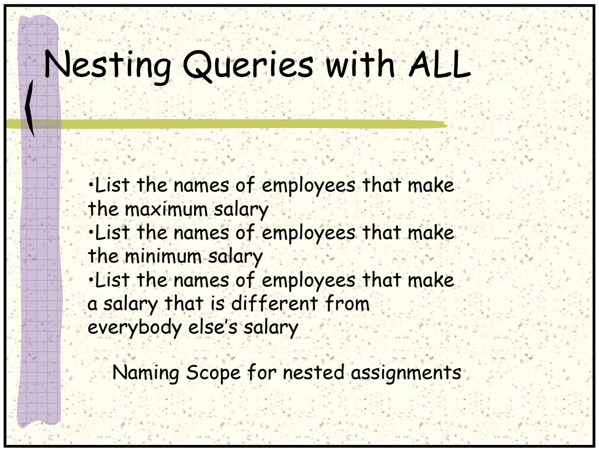
- List departments located in 'Houston'
- List departments not located in 'Houston'
- List employees without dependents
- List projects nobody works on



The ALL Operator

```
= ALL   <> ALL
< ALL   <= ALL
> ALL   >= ALL
```

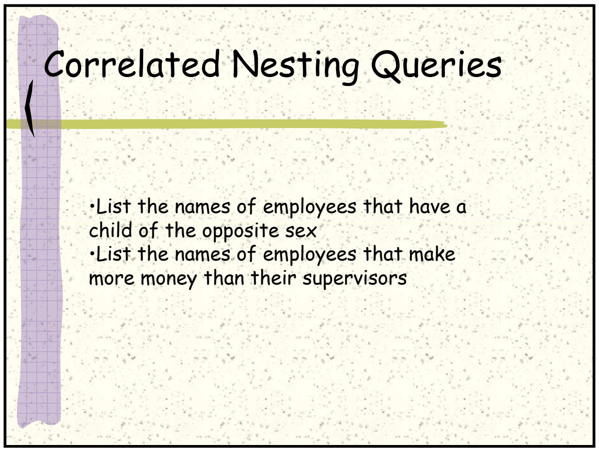
```
SELECT fname, lname
FROM employee
WHERE salary > ALL (SELECT salary FROM
                    employee WHERE dno = 5);
```



Nesting Queries with ALL

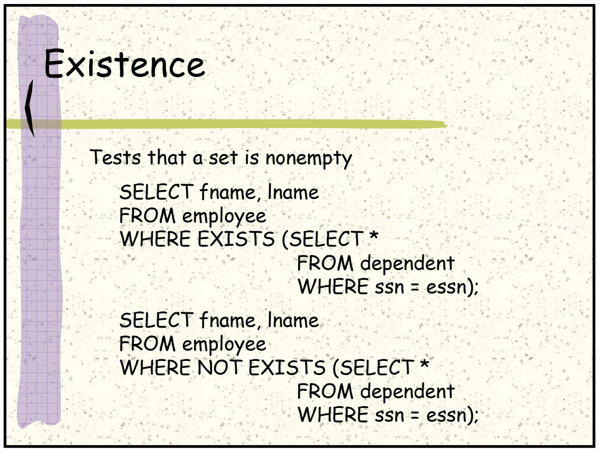
- List the names of employees that make the maximum salary
- List the names of employees that make the minimum salary
- List the names of employees that make a salary that is different from everybody else's salary

Naming Scope for nested assignments



Correlated Nesting Queries

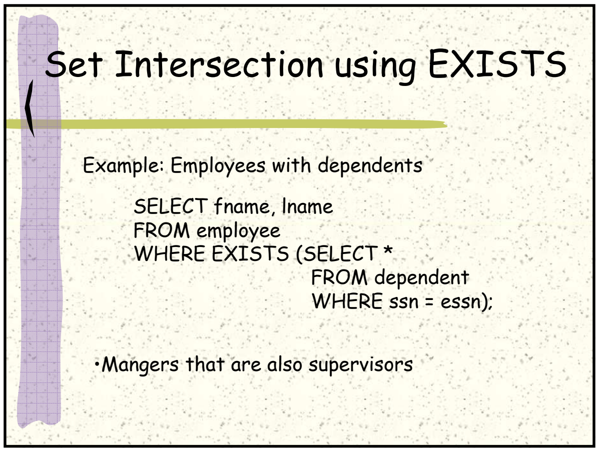
- List the names of employees that have a child of the opposite sex
- List the names of employees that make more money than their supervisors



Existence

Tests that a set is nonempty

```
SELECT fname, lname
FROM employee
WHERE EXISTS (SELECT *
                        FROM dependent
                        WHERE ssn = essn);
SELECT fname, lname
FROM employee
WHERE NOT EXISTS (SELECT *
                        FROM dependent
                        WHERE ssn = essn);
```

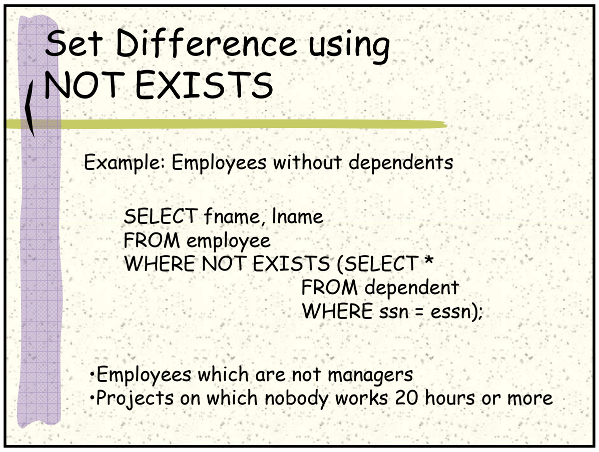


Set Intersection using EXISTS

Example: Employees with dependents

```
SELECT fname, lname
FROM employee
WHERE EXISTS (SELECT *
                        FROM dependent
                        WHERE ssn = essn);
```

- Mangers that are also supervisors

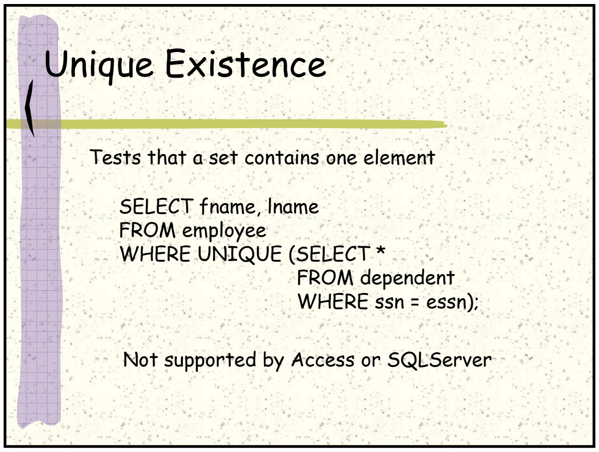


Set Difference using NOT EXISTS

Example: Employees without dependents

```
SELECT fname, lname
FROM employee
WHERE NOT EXISTS (SELECT *
                  FROM dependent
                  WHERE ssn = essn);
```

- Employees which are not managers
- Projects on which nobody works 20 hours or more

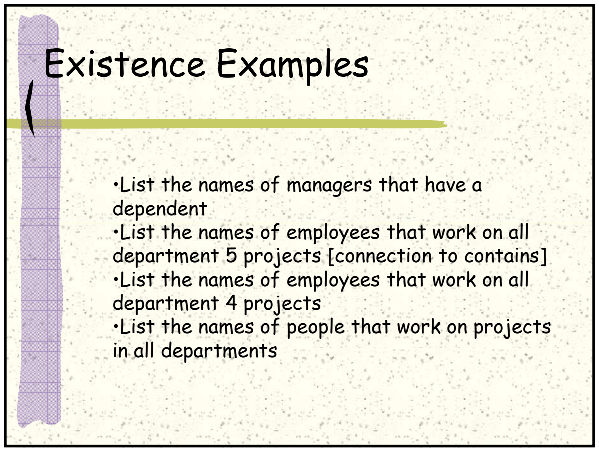


Unique Existence

Tests that a set contains one element

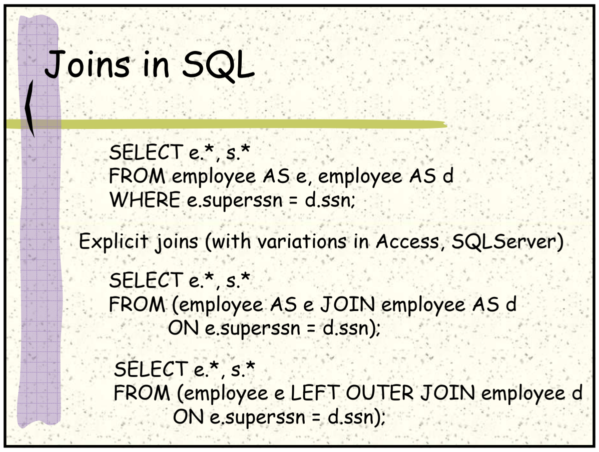
```
SELECT fname, lname
FROM employee
WHERE UNIQUE (SELECT *
              FROM dependent
              WHERE ssn = essn);
```

Not supported by Access or SQLServer



Existence Examples

- List the names of managers that have a dependent
- List the names of employees that work on all department 5 projects [connection to contains]
- List the names of employees that work on all department 4 projects
- List the names of people that work on projects in all departments

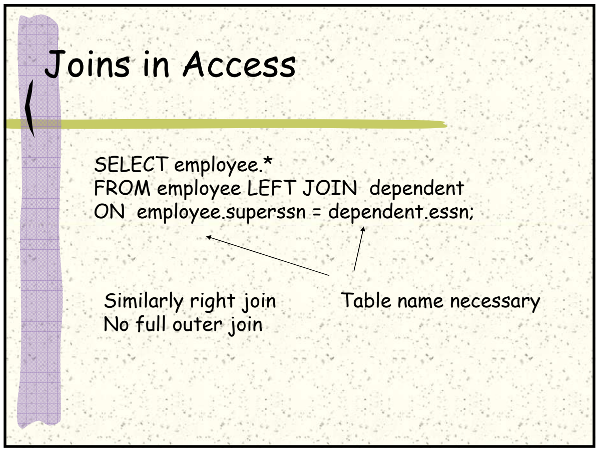


Joins in SQL

```
SELECT e.*, s.*
FROM employee AS e, employee AS d
WHERE e.superssn = d.ssn;
```

Explicit joins (with variations in Access, SQLServer)

```
SELECT e.*, s.*
FROM (employee AS e JOIN employee AS d
        ON e.superssn = d.ssn);

SELECT e.*, s.*
FROM (employee e LEFT OUTER JOIN employee d
        ON e.superssn = d.ssn);
```

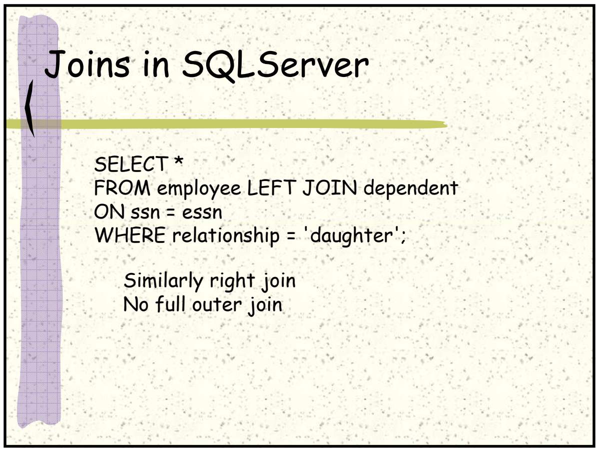


Joins in Access

```
SELECT employee.*
FROM employee LEFT JOIN  dependent
ON  employee.superssn = dependent.essn;
```

Similarly right join
No full outer join

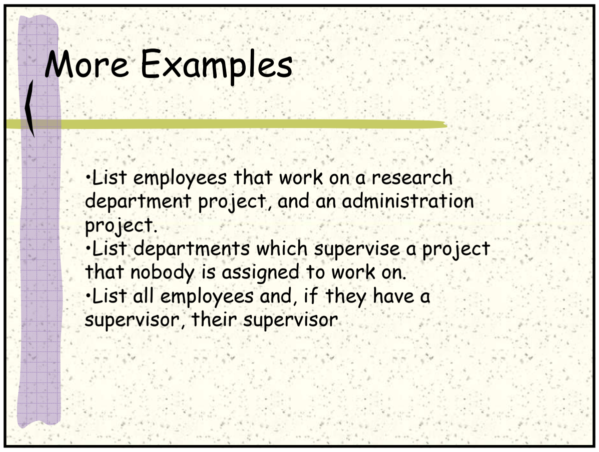
Table name necessary



Joins in SQLServer

```
SELECT *
FROM employee LEFT JOIN dependent
ON ssn = essn
WHERE relationship = 'daughter';
```

Similarly right join
No full outer join



More Examples

- List employees that work on a research department project, and an administration project.
- List departments which supervise a project that nobody is assigned to work on.
- List all employees and, if they have a supervisor, their supervisor